WHAT IS CLAIMED IS:

1. An integrated optical switch, comprising:

an optical directional coupler including a first semiconductor waveguide and a second semiconductor waveguide, wherein selected voltage differentials across the first and second waveguides correspond to selected switch states;

an optical detector comprising amorphous semiconductor material integral to the optical directional coupler and operable to select at least one of the voltage differentials.

2. The switch of claim 1 wherein the optical directional coupler and integrated detector comprises amorphous semiconductor materials.

3. The switch of claim 2 wherein the amorphous semiconductor materials are selected from amorphous germanium alloys and amorphous silicon alloys.

4. The switch of claim 1 wherein the voltage differentials cause a charge injection induced change in index of refraction.

5. The switch of claim 1 further comprising a means to apply the selected voltage differentials.

6. The switch of claim 1 wherein the optical detector includes a PIN diode.

7. The switch of claim 1 wherein the optical detector reads an optical packet header.

8. The switch of claim 1 wherein the optical packet header information controls the selected switch states.

9. The switch of claim 1 wherein the optical detector includes an intrinsic layer having amorphous germanium.

10. An integrated optical switch comprising:

a substrate;

a semiconductor waveguide on the substrate;

a first PIN diode responsive to optical signals on the waveguide, the PIN diode including a semiconductor material having an index of refraction greater than an index of refraction of the waveguide and operable to provide electrical signals; and

logic circuitry for determining address information from the electrical signals;

a second PIN diode responsive to a biasing voltage, the biasing voltage corresponding to the address information, wherein the second PIN diode causes a charge injection induced change in an index of refraction of the semiconductor waveguide.

11. The optical switch of claim 10 wherein the substrate is selected from a material comprising Si and a material comprising quartz.

12. The optical switch of claim 10 wherein the semiconductor waveguide comprises a-Si.

13. The optical switch of claim 10 wherein the first PIN diode semiconductor material comprises an amorphous semiconductor.

14. The optical switch of claim 10 wherein the first PIN diode semiconductor material comprises a-Ge.

15. The optical switch of claim 10 wherein an application of a voltage differential to the semiconductor waveguide results in a change in an index of refraction for the semiconductor waveguide due to charge injection.

16. The optical switch of claim 15 wherein the semiconductor waveguide comprises an amorphous semiconductor material, the charge injection being at least in the amorphous semiconductor material.

17. An optical switch comprising:

a substrate;

an a-Si:H layer on the substrate;

a first p-type a-Si:H layer on the a-Si:H layer;

a first electrode deposited in a defined area on the first p-type a-Si:H layer;

a second p-type a-Si:H layer on the first p-type a-Si:H layer and the electrode;

an a-Ge intrinsic layer on the second p-type a-Si:H layer;

an a-Si:H n-type layer on the a-Ge intrinsic layer;

a second electrode deposited on the a-Si:H n-type layer; and

a bottom electrode on the substrate substantially opposite the a-Si:H layer.

18. A process for making an integrated optical switch on a substrate, comprising the steps of:

depositing intrinsic amorphous silicon on the substrate;

depositing a first layer of p-type hydrogenated amorphous silicon on the intrinsic amorphous silicon;

defining bottom electrode patterns on the substrate;

depositing a first electrode on the p-type hydrogenated amorphous silicon;

defining amorphous germanium PIN detector areas on the first layer of p-type hydrogenated amorphous silicon;

depositing a second layer of p-type hydrogenated amorphous silicon on the first layer of p-type hydrogenated amorphous silicon;

depositing an amorphous germanium intrinsic layer on the second layer of p-type hydrogenated amorphous silicon;

depositing n-type hydrogenated amorphous silicon on the amorphous germanium intrinsic layer;

depositing a second electrode of the n-type hydrogenated amorphous silicon; and

depositing a bottom electrode on the substrate.

19. In an integrated opto-electronic device, a method for switching optical packets in the optical domain:

converting optical header information to electrical signals using a first PIN diode comprising amorphous semiconductor material on an amorphous semiconductor waveguide;

interpreting an address for the optical packets from the electrical signals;

biasing a second PIN diode according to the address; and

charge injecting the semiconductor waveguide according to the biasing.

20. The method of claim 19 wherein the charge injecting step includes the step of providing a voltage differential across the waveguide.